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is no telling where they came from or how far they might float. 150, or 200 miles perhaps. Thus is scattered the species over vast districts, which, no doubt, is the object of their aeronautic journey.

When they intend to make an ascension, they fix themselves on some extreme point of the branch of a tree, or weed or corn tassel; there carefully spin out a lock of white gossamer five or six inches long and two inches wide in the middle, tapering towards the ends; holding it all the time in the gentle breeze by a thread two or three inches long, which, being attached to the end of the selected point, detains the balloon until it is finished. They then spin out at the bow two lines thirty or forty feet in length, another at the stern twenty or thirty feet long, then cut the cable and float briskly upwards and forwards on an inclined plane.

I once observed one of these spiders at work on the upper corner of an open, outside door shutter. She was spinning gossamer, of which she was forming a balloon; and clinging to her thorax was a little cluster of minute, young spiders. She finished up the body of the balloon; threw out the long bow lines, which were flapping and fluttering on the now gently increasing breeze, several minutes before she got all ready for the ascension. She seemed to be fixing the bottom and widening her hammock-shaped balloon. And now the breeze being suitable, she moved to the cable in the stern, severed it, and her craft bounded upwards and soaring away northwards, was soon beyond the scope of my observation. I was standing near when it was preparing to cast loose the cable; and had thought I would arrest its flight but it bounded away with such a sudden hop, that I missed and it was gone.

ON THE NESTING OF CERTAIN HAWKS, ETC.

BY DR. ELLIOTT COUES, U. S. A.

IN a recent number of the *NATURALIST* I gave some account of the nidification of Swainson's buzzard (*Buteo Swainsoni*), but had nothing to say of the eggs, as I took the field last season too late for them. The present year I have secured numerous sets, and

noticed an interesting variation from the usual mode of nesting, necessarily brought about by the entire absence of trees. In Montana, as in most of Dakota, Swainson's buzzard occurs in great numbers over large areas of almost unbroken, arid and cactus-ridden prairie, where, even along the water-courses, there may be no trees or bushes for many miles. Several of the northern tributaries of the Milk river, which we have crossed this season, are entirely unwooded; the streams cut their sinuous course deep into the loose soil of the prairie, making on the convexity of almost every turn a bold perpendicular earth-bank a hundred feet, more or less, in height. To these "cut-banks" as they are called, Swainson's and some other hawks, to be presently mentioned, resort to breed. The nest is composed of small sticks—the stems of sage brush and other rank weeds—with grasses, etc., and is of the usual size and shape; it rests directly on the earth of some little projecting shelf of ground, generally near the top of the embankment. The eggs of this bird I have taken, fresh and in various stages of incubation, from the latter part of June till the middle of July. No one of the numerous sets contained more than two eggs; this is obviously the usual complement, in this latitude at least, though presumably not the maximum. In one instance, I found but a single egg in the nest, so far advanced in incubation that I was satisfied no other would have been laid. These eggs differ, furthermore, from what I believe to be the rule in this genus, in being nearly colorless and unmarked. They are quite like hens' eggs in general appearance, as well as in size and shape. Most of my specimens are uniform dull white, with no more evident markings than such obsolete grayish spots as are frequently observed in the eggs of the marsh hawk (*Circus cyaneus Hudsonicus*); a few have some obvious dirty-brown scratchy spots, in every instance at the small end; none are marked all over, nor are any of them strongly blotched at all. It would have been impossible to predicate the normal character of these eggs upon any rule which might be supposed to hold in this genus. Plain colorless eggs, the well-known exceptions in the cases of many or most species of Buteo, are here the rule.

It may not be generally known that the ferrugineous buzzard (*Archibuteo ferrugineus*) which is accredited, and properly so, with a decidedly western range, is a common species of eastern Montana and the adjoining portions of Dakota, in latitude 49°. I have

frequently seen it this summer along the northern tributaries of Milk river, where I have secured some fine specimens of old and young, and observed its nidification. This is precisely the same as that of *Buteo Swainsoni*, the nest which I found being placed on a little projection on the face of an earth bluff. It contained three young, about ready to take flight, July 18th.

I was still more surprised to find yet a third species of hawk nesting in the same unusual manner. This was the peregrine falcon or duck hawk (*Falco communis*), a bird whose nidification, under varying circumstances, has occasioned some little controversy, and entered into the discussion of the relationship of the American to the European form. I was much gratified to discover the nest, which very few ornithologists have seen in this country, and to note how readily the bird adapted itself to its special surroundings. In this region the falcon may be truthfully said to nest *on the ground*; yet we must remember that it is merely the replacing by an earthen embankment of the rocky crags where the bird is described as usually nesting. In effect the location is the same. One of the two nests I found was almost within rifle-shot of the two spots where Swainson's and the ferrugineous buzzard were respectively nesting. It was almost a burrow in the ground, so completely was it hidden on a little shelf of earth beneath a projecting mass, and further concealed by a tall column of earth nearly washed away from the face of the bank. This nest contained three young ones, just able to fly. On lowering a man down by a rope over the brow of the bank, they left the nest and circled about till two were shot; one parent had been already destroyed; the other was not seen. The third young one was afterward brought to me by a soldier who had managed to capture it alive; it is still in my possession, and is proving itself a spirited and enterprising prisoner. The other nest was on the bare face of a perpendicular embankment, on a slight shelf about twelve feet below the top. It likewise contained three young (July 19th), not yet able to leave the nest. Both parents hovered overhead with loud harsh cries; the male kept at a respectful distance, but the mother bird, more intrepid in the defence of her home, menaced me at close range, till, at one of her swoops, I brought her to the ground. I endeavored without success to lasso the young ones out of the nest; they repeatedly cleared themselves of the noose just as it began to draw upon them; and as the crumbling state of

the bank rendered descent to the nest too dangerous to be tried, I left the family to the care of the father, who, it is to be hoped, has since done more for his family than he did on the occasion just mentioned.

The character of the embankments on which all these hawks nested may be perfectly indicated in the fact that they were also the resort of myriads of cliff swallows (*Hirundo lunifrons*). Thousands of the swallows' nests patched the face of the banks in various places; one large cluster was noticed near a buzzard's nest; while another group was affixed within a few feet of one of the falcon's nests. I was not long enough on the spot to determine whether the swallows were fond of their bold and powerful neighbors or not.

In speaking of this unusual association of swallows and falcons, I am reminded to note a somewhat similar arrangement between a pair of Arkansas flycatchers, and Swainson's buzzard; their nests being in the same tree and but a few feet apart. Both birds were incubating at the time of my visit.

The Arkansas flycatcher (*Tyrannus verticalis*), is one of the commonest of the small birds along the Upper Missouri and the wooded parts of the Milk river and its tributaries. So far as I have observed, however, it will not go into an entirely treeless country. In travelling over the prairie, no sooner do we strike a "coulé" (ravine) with scattered cottonwoods and box-elders, than we hear the shrill cries of these birds; and the nest—or several of them—may usually be soon discovered, the nest being bulky, and the trees straggling, with thin foliage. These birds lay later than most species in this country. I have taken fresh eggs up to the middle of July, and am sure there was no previous brood. The nests are in a fork or crotch, generally far out on the limb, but sometimes directly against the trunk; and at any height from five or six to forty or fifty feet. The common kingbird is generally seen in company with this species; I have taken both nests from the same tree. The eggs of the two are indistinguishable; nor can the nests be told apart with certainty; though on an average the Arkansas is the larger, softer and fluffier, with more weedy and downy material and fewer slender rootlets; it is also rather less compactly built. The eggs run from three to six in number. With the same general habits, these two flycatchers may instantly be recognized by the voice; that of the Arkansas is much harsher

and louder than that of the common kingbird, which more nearly resembles the twittering of a martin. The difference is very noticeable when the two species are hovering together overhead, bewailing the spoliation of their homes.

Our common kingbird may be added to the long list of the cowbird's victims, and to the shorter catalogue of those ingenious birds who get rid of the obnoxious egg by building a two-story nest. I have such a one in my collection, with a cowbird's egg safely shut up in the basement.

Nothing that I am aware of has been entered upon the records respecting the nidification of the mountain plover (*Eudromias montana*). I find it breeding quite commonly in all the region immediately north of the Milk river, and extending at least as far east as the mouth of this river. It nests on the open prairie, in June and July. There is nothing peculiar in the nidification; the nest is merely a slight depression, lined with a few grass blades. The only set of eggs I have contains three; and as I have several times noticed the parent leading her brood of three young over the prairie, I conclude that this number, and not four, is the usual complement, in this latitude at least. The eggs are as described in my late work; they are rather peculiar, and little liable to be confounded with those of any of the allied waders. When startled from the nest the bird makes off crouching low, running swiftly but with frequent pauses, and uttering meanwhile a low chattering note, quite unlike the ordinary soft mellow cry. As I have said, the bird nests anywhere on the dry prairie; but if it have any preference, it is for the stretches of low loose grassy ground where the prairie dogs settle, as distinguished from the more arid and gravelly or stony prairie. The period of nesting must be protracted; for I have taken nearly fresh eggs at the same time that I saw broods running about, and but a few days before well feathered young, no longer under charge of the parent were obtained.

The numberless alkaline pools or small lakes with which portions of Dakota and Montana are cursed are the favorite breeding resorts of two very elegant and interesting birds; the avocet, and Wilson's phalarope. These two species are always intimately associated in my mind, so frequently have I found them together, not only in this region, but in Kansas and other parts of the west. The avocet is one of the most conspicuous birds of the saline regions of our Territories. In flight we recognize it at any dis-

tance by its resemblance to a miniature crane ; its body white, and wings black, its long blue legs stretched stiffly straight behind, and the measured sweep of its ample wings, unlike the quicker beats of the thin, pointed pinions of its allies. Its voice is also characteristic ; the harsh noise is incessant when the breeding places are invaded. This bird must nest quite early ; as I found no eggs, and by the middle of July well grown and completely feathered young birds were flocking. These may be distinguished from the adults among other marks, by the curiously swollen condition of the shank ; the upper part of the tarsus being two or three times as thick as the tibia. It is much the same with the phalaropes and other waders. As regards the singular bill of the avocet, the amount of curvature of which has occasioned no little discussion, I may observe that I have shot some birds with the bill about as much curved as it is represented to be in Wilson's figure, which has been severely criticised, and others with the bill as straight as Audubon drew it ; nor was the difference, so far as I could see, anything more than fortuitous. The degree of swimming power the avocet possesses has also been variously estimated. The bird generally wades about after its food ; but on striking a deep place begins to swim without the slightest hesitation ; and moreover, I have seen it alight from on wing on deep water, and swim about as freely as a duck. In this respect, the avocet and the phalarope are about on a par.

One of the most generally diffused of the birds that breed along the Upper Missouri and in the Milk river region is the long-billed curlew (*Numenius longirostris*). I have travelled for days together and scarcely lost sight of these birds for an hour, during the daytime ; while at night their piercing and lugubrious cries resounded to the howling of the wolves. There is something peculiarly melancholy, and almost foreboding, in their screams, heard in these remote wilds, where the traveller is never entirely free from a sense of contingent danger. The birds breed anywhere on the broad prairie—perhaps oftenest in the vicinity of pools and sloughs, but not necessarily near water. The eggs are mostly laid in June, but there is a wide range in the time. Thus I have taken a set in July, having previously caught young birds. These, like other waders when young, have a curiously clumsy and gawky appearance when running over the prairie, as if their legs were too long and heavy to be easily managed. They may

readily be caught during the first week or two. At this age the bill is about two inches long, comparatively stout throughout, and scarcely decurved.

Among the smaller birds of the boundless prairie, a few species are specially notable. The commonest and most universally diffused is the western horned lark (*Eremophila alpestris leucolæma*) ; we find it breeding everywhere. It begins to lay very early ; the curiously speckled young ones, quite unlike the adults, may be taken any time in June, already flying ; while eggs (doubtless of a second brood) may be secured through July. The mode of nesting of the larks, and of the three most conspicuous prairie *fringillaries*, is substantially the same. The three to which I refer are the bay-winged bunting (*Poocetes gramineus confinis*), the chestnut-collared bunting (*Plectrophanes ornatus*) and Maccown's bunting (*P. Maccownii*). These two *Plectrophanes* are the most characteristic of the prairie sparrows, and are found together in abundance in most of the regions here under consideration. *P. ornatus* however, is rather the more easterly of the two. Thus, it is common all over northern Dakota and the eastern part of Montana ; while I have seen none since I came the first few miles up the Milk river, where *P. Maccownii* increases in numbers, then becomes the prevailing, and finally the only species. The chestnut-collared has a very pretty habit of soaring, like Sprague's lark, while the female is incubating, singing in the air, and letting itself gradually down like a parachute, with the wings stretched upward at a right angle with each other—an action that displays the glossy black of the under parts and the white of the tail to the best advantage. Floating thus lightly in the air they remind one of butterflies ; and their song, though not of the highest excellence, is sweet, gladsome and musical.

Great numbers of water-fowl stay their flight to nest in the pools and sloughs of our Northern Boundary ; among them may be mentioned mallards, widgeons, shovellers, teals, pintails, scaups, buffle-heads and wild geese. To resume the subject with which this slight article began, namely, exceptional modes of nesting, I would say that the geese of this region sometimes nest on the ground around the ponds, as geese ordinarily do, and then again they sometimes *nest in trees*, somewhat like wood ducks, only that they do not enter holes for this purpose. Arboreal nidification of geese sounds strangely, but it is nevertheless true ; and it is a well

known circumstance to those persons who inhabit the country, however unenlightened ornithologists may be in the matter. It furnishes a case parallel with that related by Audubon, of the herring gull nesting in communities, in trees.

I will conclude with an observation on the digestive arrangements of the sage cock—a bird which I have only lately seen alive. It has been repeatedly stated to feed exclusively upon sage leaves. All those I shot had the craw full of grasshoppers and other insects, and had nothing else in it. It has also been asserted that the bird has no gizzard; the gizzard is indeed quite thin, so as to appear merely a membranous bag, but for all I could see that the disposition of the muscles is the same as that obtaining in other gallinaceous birds. The case is simply a reduction of the amount of muscle, without any essential change in arrangement. At least this is the result of an off-hand dissection, such as one would be likely to make in the field. The change is an evident adaptation to the soft and succulent or juicy nature of the bird's food—buds, leaves and insects, instead of grain. There is another peculiarity of this bird, also dependent upon its food, and the nature of the digestive process. When flushed it almost invariably acts in the way which has given the green heron (*Ardea virescens*) its inelegant popular appellation.—*Milk River, at 49°, July 25, 1874.*

THE METAMORPHOSIS OF FLIES.* I.

BY DR. AUGUST WEISSMAN.

BEFORE I pass to the general results of the foregoing observations a short chronological exhibit of all the processes of development will be useful.

In agreement with all the earlier observations on the embryology of other insects it is apparent that during the life of the larva, in its outer form as well as the internal organs, only the

*Though Weissman's famous work, "The Development of Diptera," was published as long ago as 1864, yet we feel sure our readers will value the translation of a few of the concluding chapters which have not previously been rendered into English. The present chapter is entitled "View of the Phenomena of Development."—A. S. P.